

MEASUREMENTS OF NEUTRON SPECTRA PRODUCED FROM A THICK IRON TARGET BOMBARDED WITH 1.5 GeV PROTONS

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For the validation of the calculation code employed in the design of the pulse spallation neutron source and the accelerator driven system, it is required the spectrum of neutrons produced from a thick target, which is longer than the mean free path of the outgoing particles. However, these experimental data were scarce for the projectiles with energy above 800 MeV. In this study, the spectrum of neutrons produced from an iron target was measured to estimate the source of the neutron produced from the beam dump and the magnet. Furthermore, these experimental data were compared with the results calculated with NMTC/JAM.

The experiment was performed at carried out at the $\pi 2$ beam line of the 12-GeV proton synchrotron at KEK. Incident particles were supplied as the secondary particle generated by an internal target, which was placed in the 12-GeV proton beam. Spectra of neutrons produced from an iron target with 20 cm in thickness were measured, which was irradiated by 1.5 GeV protons. Measurements were performed by time-of-flight technique using NE213 scintillators. The flight time of the projectiles was also measured to identify the proton from other positive charged particles. The calculated result of NMTC/JAM and MCNP-4A was compared with the present experimental data. It is found that the NMTC/JAM generally gives a good agreement with experiment. Furthermore, the calculation gives good agreement with the experiment in the energy region between 20 and 80 MeV, whereas the NMTC/JAM gives 50